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EXAMINER

SALERNO, SARAH KATE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/567,369	Applicant(s) ICHINOSE ET AL.	
	Examiner SARAH K. SALERNO	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 November 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2 and 4-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 4-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicant's amendment/arguments filed on 11/19/08 as being acknowledged and entered. By this amendment claim 3-5 is canceled, claims 9-21 have been added and claims 1, 2, and 4-21 are pending and claims 3-5 are withdrawn.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1,2 and 4-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Ichinose et al. (US PGPub 2004/0007708)

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Claim 1: Ichinose teaches a semiconductor layer, comprising:

a first layer comprising a Ga₂O₃ system single crystal substrate; and

a second layer obtained by replacing a part rather than all of oxygen atoms of the first layer with nitrogen atoms [0038-0096].

Claim 2: Ichinose teaches the second layer comprises a GaN system compound semiconductor [0038-0096].

Claim 4: Ichinose teaches the first layer comprises Ga_2O_3 , $(\text{In}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 \leq x < 1$, $(\text{Al}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 \leq x < 1$, $(\text{In}_x\text{Al}_y\text{Ga}_{1-x-y})_2\text{O}_3$ where $0 \leq x < 1$, $0 \leq y < 1$, and $0 \leq x + y < 1$, or the like, as a main constituent [0038-0096].

Claim 5: Ichinose teaches the second layer comprises GaN, $\text{In}_z\text{Ga}_{1-z}\text{N}$ where $0 \leq z < 1$, $\text{Al}_z\text{Ga}_{1-z}\text{N}$ where $0 \leq z < 1$, $\text{In}_z\text{Al}_p\text{Ga}_{1-z-p}\text{N}$ where $0 \leq z < 1$, $0 \leq p < 1$, and $0 \leq z + p < 1$, or the like, as a main constituent [0038-0096].

Claim 6: Ichinose teaches a semiconductor layer, comprising:

a first layer comprising a Ga_2O_3 system semiconductor;

a second layer comprising a GaN system compound semiconductor and obtained by replacing a part or all of 6 oxygen atoms of the first layer with nitrogen atoms; and

a third layer comprising a GaN system epitaxial layer and formed on the second layer [0038-0096].

Claim 7: Ichinose teaches a semiconductor layer, comprising:

a first layer comprising a Ga_2O_3 system semiconductor; and

a second layer comprising a GaN system compound semiconductor and formed on the first layer, wherein the first layer comprises at least one of $(\text{In}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 \leq$

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$x < 1$, $(\text{Al}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 \leq x < 1$, $(\text{In}_x\text{Al}_y\text{Ga}_{1-x-y})_2\text{O}_3$ where $0 \leq x < 1$, $0 \leq y < 1$, and $0 \leq x + y < 1$ [0038-0096].

Claim 8: Ichinose teaches a semiconductor layer, comprising:

a first layer comprising a Ga_2O_3 system semiconductor;

a second layer comprising a GaN system compound semiconductor and formed on the first layer; and

a third layer comprising a GaN system epitaxial layer and grown on the second layer [0038-0096].

Claim 9: Ichinose teaches the first layer consists of a single crystal β - Ga_2O_3 .

Claim 10: Ichinose teaches the single crystal β - Ga_2O_3 has a prismatic shape having a square in cross section, and its axis direction matches a-axis 100° orientation, b-axis 010° orientation or c-axis 001° orientation [0038-0096].

Claim 11: Ichinose teaches the first layer comprises $(\text{In}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 < x < 1$ [0038-0096].

Claim 12: Ichinose teaches the first layer comprises $(\text{Al}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 < x < 1$ [0038-0096].

Claim 13: Ichinose teaches the first layer comprises $(\text{In}_x\text{Al}_y\text{Ga}_{1-x-y})_2\text{O}_3$ where $0 < x < 1$, $0 < y < 1$, and $0 < x + y < 1$ [0038-0096].

Claim 14: Ichinose teaches the second layer comprises a same compound semiconductor as the third layer [0038-0096].

Claim 15: Ichinose teaches the first layer consists of single crystal β - Ga_2O_3 [0038-0096].

Claim 16: Ichinose teaches the first layer further comprises a single crystal β - Ga_2O_3 [0038-0096].

Claim 17: Ichinose teaches the single crystal 03- Ga_2O_3 has a prismatic shape having a square in cross section, and its axis direction matches a-axis 100° orientation, b-axis 010° orientation, or c-axis 001° orientation [0038-0096].

Claim 18: Ichinose teaches a third layer comprising a GaN system epitaxial layer grown on the second layer [0038-0096].

Claim 19: Ichinose teaches the second layer comprises a same compound semiconductor as the third layer [0038-0096].

Claim 20: Ichinose teaches the first layer consists of single crystal β - Ga_2O_3 [0038-0096].

Claim 21: Ichinose teaches a semiconductor layer, comprising:
a first layer comprising a Ga_2O_3 system single crystal substrate; and
a second layer obtained by replacing a part rather than all of oxygen atoms of the first layer with nitrogen atoms, wherein the second layer comprises a GaN system compound semiconductor [0038-0096].

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 2, 4-6, 8, 14, 19 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Itoh et al. (US Patent 6,218,207).

Claim 1: Itoh teaches a semiconductor layer, comprising:
a first layer (22) comprising a Ga_2O_3 system single crystal substrate; and
a second layer (22a) obtained by replacing a part rather than all of oxygen atoms of the first layer with nitrogen atoms (FIG. 2A-2C; Col. 5-7).

Claim 2: Itoh teaches the second layer comprises a GaN system compound semiconductor (FIG. 2A-2C; Col. 5-7).

Claim 4: Itoh teaches the first layer comprises Ga_2O_3 , $(\text{In}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 \leq x < 1$, $(\text{Al}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 \leq x < 1$, $(\text{In}_x\text{Al}_y\text{Ga}_{1-x-y})_2\text{O}_3$ where $0 \leq x < 1$, $0 \leq y < 1$, and $0 \leq x + y < 1$, or the like, as a main constituent (FIG. 2A-2C; Col. 5-7).

Claim 5: Itoh teaches the second layer comprises GaN, $\text{In}_z\text{Ga}_{1-z}\text{N}$ where $0 \leq z < 1$, $\text{Al}_z\text{Ga}_{1-z}\text{N}$ where $0 \leq z < 1$, $\text{In}_z\text{Al}_p\text{Ga}_{1-z-p}\text{N}$ where $0 \leq z < 1$, $0 \leq p < 1$, and $0 \leq z + p < 1$, or the like, as a main constituent (FIG. 2A-2C; Col. 5-7).

Claim 6: Itoh teaches a semiconductor layer, comprising:
a first layer (22) comprising a Ga_2O_3 system semiconductor;
a second layer (22a) comprising a GaN system compound semiconductor and obtained by replacing a part or all of 6 oxygen atoms of the first layer with nitrogen atoms; and

a third layer (25) comprising a GaN system epitaxial layer and formed on the second layer (FIG. 2A-2C; Col. 5-7).

Claim 8: Itoh teaches a semiconductor layer, comprising:

a first layer (22) comprising a Ga_2O_3 system semiconductor;
a second layer (22a) comprising a GaN system compound semiconductor and formed on the first layer; and
a third layer (25) comprising a GaN system epitaxial layer and grown on the second layer (FIG. 2A-2C; Col. 5-7).

Claim 14: Itoh teaches the second layer comprises a same compound semiconductor as the third layer (FIG. 2A-2C; Col. 5-7).

Claim 19: Itoh teaches the second layer comprises a same compound semiconductor as the third (FIG. 2A-2C; Col. 5-7).

Claim 21: Itoh teaches a semiconductor layer, comprising:
a first layer (22) comprising a Ga_2O_3 system single crystal substrate; and
a second layer (22a) obtained by replacing a part rather than all of oxygen atoms of the first layer with nitrogen atoms, wherein the second layer comprises a GaN system compound semiconductor (FIG. 2A-2C; Col. 5-7).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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7. Claims 9, 10, 12, 15 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. (US Patent 6,218,207) as applied to claim 1 above, and further in view of Ota et al. (US PGPub 2003/0107098).

Regarding claim 9, as described above, Itoh substantially reads on the invention as claimed, except Itoh does not teach the first layer consists of a single crystal β -Ga₂O₃. Ota teaches the first layer consists of a single crystal β -Ga₂O₃ in a light emitting device because of its stability [0029-0030, 0042]. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the first layer taught by Itoh to be β -Ga₂O₃ because of its stability as taught by Ota [0029-0030, 0042].

Claim 10: Ota teaches the single crystal β -Ga₂O₃ has a prismatic shape having a square in cross section, and its axis direction matches a-axis 100> orientation, b-axis 010> orientation or c-axis 001> orientation [0029-0030, 0042].

Claim 12: Ota teaches the first layer comprises (Al_xGa_{1-x})₂O₃ where 0 < x < 1 [0029-0030, 0042].

Claim 15: Ota teaches the first layer consists of single crystal β -Ga₂O₃ [0029-0030, 0042].

Claim 20: Ota teaches the first layer consists of single crystal β -Ga₂O₃ [0029-0030, 0042].

8. Claims 7 and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. (US Patent 6,218,207) in view of Ota et al. (US PGPub 2003/0107098).

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Claim 7: Itoh teaches a semiconductor layer, comprising:

a first layer (22) comprising a Ga_2O_3 system semiconductor; and

a second layer (22a) comprising a GaN system compound semiconductor and formed on the first layer (FIG. 2A-2C; Col. 5-7).

Itoh does not teach the first layer comprises at least one of $(\text{In}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 < x < 1$, $(\text{Al}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 < x < 1$, $(\text{In}_x\text{Al}_y\text{Ga}_{1-x-y})_2\text{O}_3$ where $0 < x < 1$, $0 < y < 1$, and $0 < x + y < 1$. Ota teaches the first layer comprises at least one of $(\text{In}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 < x < 1$, $(\text{Al}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 < x < 1$, $(\text{In}_x\text{Al}_y\text{Ga}_{1-x-y})_2\text{O}_3$ where $0 < x < 1$, $0 < y < 1$, and $0 < x + y < 1$. to increase light transmittance [0029-0030, 0042]. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the first layer taught by Itoh to comprise at least one of $(\text{In}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 < x < 1$, $(\text{Al}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 < x < 1$, $(\text{In}_x\text{Al}_y\text{Ga}_{1-x-y})_2\text{O}_3$ where $0 < x < 1$, $0 < y < 1$, and $0 < x + y < 1$. to increase light transmittance as taught by Ota [0029-0030, 0042].

Claim 16: Ota teaches the first layer further comprises a single crystal β -Ga₂O₃ [0029-0030, 0042].

Claim 17: Ota teaches the single crystal β -Ga₂O₃ has a prismatic shape having a square in cross section, and its axis direction matches a-axis 100> orientation, b-axis 010> orientation, or c-axis 001 > [0029-0030, 0042].

Claim 18: Itoh teaches a third layer comprising a GaN system epitaxial layer grown on the second layer (FIG. 2A-2C; Col. 5-7).

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9. Claims 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. (US Patent 6,218,207) in view of Braddock (US Patent 6,989,556).

Regarding claims 11 and 13, as described above, Itoh substantially reads on the invention as claimed, except Itoh does not teach the first layer comprises $(\text{In}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 < x < 1$. Braddock teaches $(\text{In}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 < x < 1$ as a well known Group III-V compound used in light emitting devices (Col. 4). The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted β - Ga_2O_3 with $(\text{In}_x\text{Ga}_{1-x})_2\text{O}_3$ where $0 < x < 1$ because of its known use in light emitting devices as taught by Braddock (Col. 4)

Response to Arguments

10. Applicant's arguments with respect to claims 1, 2 and 4-21 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to whose telephone number is (571)270-1266. The examiner can normally be reached on M-F 8:00-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. K. S./
Examiner, Art Unit 2814

/Theresa T. Doan/
Primary Examiner, Art Unit 2814